

WHAT IS CLAIMED IS:

1. A communication system supporting peer-to-peer communication between ONUs (optical network units) in an Ethernet-based PON (passive optical network), the system comprising:

5 a physical layer receiving frames (including frames to which PON-tags have been attached to their preambles) transmitted from an OLT (optical line termination); and

data link layers including an emulation layer, a MAC layer, a MAC control layer, and a MAC emulation layer that process frames received through
10 the physical layer,

wherein the data link layers further include a P2PE layer positioned between the emulation layer and the MAC layer, for generating and managing (1) an address table that matches PON-tags of frames received from ONUs and transmission point addresses, and (2) a mirror address table of the
15 address table; and

a FRM (frame reflecting and multiplexing) layer positioned between the MAC control layer and the MAC emulation layer, for performing, according to a target address of the frames, an upstream process that transmits or broadcasts frames to an upper layer and a downstream process that
20 transmits or broadcasts frames to a lower layer.

2. The system of claim 1, wherein the P2PE layer comprises:

a frame receiver receiving a first frame transmitted from the physical layer;

an address table processor generating the address table that matches a PON-tag of the first frame with a transmission point address, and generating the mirror address table of the address table;

a frame processor transmitting the first frame to an upper layer;

5 a search unit receiving a second frame transmitted from an upper layer, and searching the address table to find a PON-tag corresponding to a target address of the second frame; and

a PON-tag processor attaching a PON-tag corresponding to the target address to a preamble of the second frame.

10 3. The system of claim 2, wherein the FRM layer comprises:

an address determining unit generating and managing an upper address table, and determining a target address of the first frame input based on the mirror address table and the upper address table; and

15 an upstream frame processor forwarding the first frame to an upstream layer or reflecting toward an ONU according to address determination results.

4. The system of claim 3, wherein the upstream frame processor transmits the first frame to an upper bridge if the target address of the first frame is an external address of the EPON,

20 broadcasts the first frame to an upstream layer and in an ONU direction in the case where the target address of the first frame is not in the upper address table and the mirror address table or it is a broadcast address, and

returns the first frame to a downstream layer if the target address of

the first frame is in the mirror address table.

5. The system as in either claim 2, wherein the FRM layer further comprises a downstream frame processor that flags a target address of a second frame transmitted from an upper layer in the address table, and

5 wherein the search unit searches only addresses flagged by the downstream frame processor in the address table, finds PON-tags corresponding to target addresses of downstream frames, and transmits the PON-tags to the PON-tag processor.

6. The system of claim 5, wherein the PON-tag processor attaches a
10 broadcasting PON-tag to a preamble of the second frame in the case where the target address of the second frame is not in the address table, and transmits the broadcasting PON-tag to the physical layer.

7. The system of claim 1, wherein the FRM layer performs a multiplexing function between the second frame from an upstream layer and
15 the frame reflected in the FRM.

8. A communication method for a system supporting peer-to-peer communication between ONUs in an Ethernet-based PON, the method comprising:

(a) receiving a first frame from the ONUs;

20 (b) generating an address table that matches a PON-tag of the first frame and a transmission point address, and generating a mirror address table of the address table;

(c) generating and managing an upper address table, and determining a target address of the first frame based on the mirror address

table and the upper address table; and

(d) forwarding to an upper layer or reflecting to an ONU the first frame based on results of the address determination.

9. The method of claim 8, further comprising:

5 (e) receiving a second frame transmitted from an upper layer, and searching the address table to find a PON-tag corresponding to the target address of the second frame; and

(f) attaching the PON-tag corresponding to the target address to the preamble of the second frame, and transmitting the PON-tag to a physical
10 layer.

10. The method of claim 8, wherein (d) comprises:

transmitting the first frame to an upper bridge in the case where the target address of the first frame is an external address of the EPON;

15 broadcasting the first frame to an upstream layer and in an ONU direction in the case where the target address of the first frame is not in the upper address table and the mirror address table or it is a broadcast address; and

returning the first frame to a downstream layer if the target address of the first frame is in the mirror address table.

20 11. The method of claim 9, wherein (e) comprises:

flagging the target address of the second frame transmitted from an upper layer in the address table; and

searching only addresses flagged in the address table, and finding a PON-tag corresponding to a target address of a downstream frame.